UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND.TRADEMARKS
Washington, D.C. 20231

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
09/512,149	02/23/00	AGARWAL V	MI22-1322

021567
WELLS ST JOHN ROBERTS GREGORY AND MATKIN
SUITE 1300
601 W FIRST AVENUE
SPOKANE WA 99201-3828

MMC2/0906

EXAMINER	
PIZARRO CRESPO,M	
ART UNIT	**PAPER NUMBER**
2814	13

DATE MAILED: 09/06/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary	Application No.	Applicant(s)	
	09/512,149	AGARWAL, VISHNU K	
	Examiner	Art Unit	
	Marcos D. Pizarro-Crespo	2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 July 2001* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 and 4-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1 and 4-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

Attorney's Docket Number: MI22-1322
Filing Date: 4/24/2000
Claimed Foreign Priority Date: none
Applicant(s): Agarwal
Examiner: Marcos D. Pizarro-Crespo

DETAILED ACTION

This office action is in response to the amendment filed 7/25/2001 (paper no. 12).

Acknowledgment

1. The amendment filed on 7/25/2001, paper no. 12, in response to the Office action mailed on 5/2/2001, paper no. 10, has been entered. The present Office action is made with all the suggested amendments being fully considered. Accordingly, pending in this office action are claims 1 and 4-16.

Continued Examination Under 37 CFR 1.114

2. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 7/25/2001 has been entered.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1, 4-9, 11, 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Anderson (US 5,390,072) in view of Bruchhaus (WO 9744797).

5. Anderson shows most aspects of the instant invention including an integrated circuitry comprising (fig.2):

- A first capacitor electrode **20**
- A second capacitor electrode **24**
- A high dielectric constant layer between the capacitor electrodes comprising:
  - An amorphous material layer **22**
  - A crystalline material layer **23** over the amorphous material layer **22**

  (col.2/ll.49-54, col.6/ll.47-53)

However, Anderson does not show the amorphous material layer and the crystalline layer constituting different chemical compositions. Bruchhaus, on the other hand, teaches that by having the dielectric layers of a capacitor formed from at least two different dielectric materials, it is possible for the electrical properties of the capacitor to be matched exactly to a desired profile (col.2/ll.44-49)[1]. For example, the temperature response or the temperature characteristic of the electrical values of the capacitor, i.e., the temperature sensitivity of the capacitor, can be adjusted (col.2/ll.49-52). In other words, the temperature response can be optimized by a suitable choice or combination of different dielectric layers (abstract). See for example figure 10, in which Bruchhaus

shows how the dielectric constant, ϵ_r, of a dielectric layer material system, i.e., $(Ba_{1-a}Sr_a)TiO_3$ or BST, varies as a function of its chemical composition (different values of a). It should be noted that such a material system of dielectric layers include $BaTiO_3$ (when a=0), which is a preferred dielectric material to be used in Anderson's capacitor. It would have been obvious at the time of the invention to one of ordinary skill in the art to select suitable chemical compositions for the dielectric layers in the capacitor of Anderson, as suggested by Bruchhaus, since the chemical composition is a variable of importance that will allow to control the electrical properties of the capacitor to be matched to a desired profile.

6. Regarding claim 4, Anderson teaches that the upper and lower electrodes generally comprise a suitably conductive metallic oxide or a metal (col.3/ll.14-18).

7. Regarding claims 5-9, 11 and 13-14, figure 2 shows a capacitor over a semiconductor substrate **21**, a dielectric layer received between two capacitor plates **20 24**, an amorphous dielectric material **22** contacting one capacitor plate **20**, a crystalline dielectric material **23** contacting a second capacitor plate **24**, wherein the dielectric region is the only capacitor dielectric region received between the capacitor electrodes **20 24**.

8. Regarding claim 15, Anderson discloses one embodiment of a capacitor being received over a semiconductor substrate with a high dielectric-constant amorphous layer between the substrate and a high dielectric-constant crystalline layer (col.2/ll.49-57).

---

[1] All quotations from Bruchhaus are from its attached English equivalent US 6,108,191.

9. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Anderson, in view of Shimizu, as applied to claim 1 above, and further in view of Ramakrishnan (US 5,943,580).

10. Anderson, in view of Shimizu, shows most aspects of the instant invention but a capacitor wherein the amorphous dielectric material and the crystalline dielectric material is at least 98% amorphous and 98% crystalline, respectively (see paragraphs 4-7). Ramakrishnan teaches a method of forming capacitors on semiconducting substrates having insulating films with high-dielectric constants (col.1/ll.6-9). Ramakrishnan also teaches that by controlling the thermal treatment process the degree of crystallinity of the dielectric layer can be controlled and by doing so one is able to create capacitors with a suitable value of dielectric constant on a single substrate (col.2/ll.65-col.3/ll.16). Moreover, Ramakrishnan teaches that by controlling the dielectric constant one is able to control the capacitance of the condenser (col.4/ll.24-40). Accordingly, it would have been an obvious matter of design choice to select the degree of crystallinity for the amorphous and the crystalline dielectric layer as taught by Ramakrishnan, since the degree of crystallinity of the dielectric layer is a variable of importance that allows to control the capacitance of the condenser. Therefore, it would have been obvious at the time of the invention to one of ordinary skill in the art to select suitable degrees of crystallinity for the amorphous and crystalline dielectric layer of Anderson, in view of Shimizu, as taught by Ramakrishnan, according to the desired capacitance for the condenser.

11. Claims 12 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Anderson, in view of Shimizu, as applied to claim 1 above, and further in view of Graettinger (US 5,844,771).

12. Anderson, in view of Shimizu, shows most aspects of the instant invention but a capacitor wherein the semiconductor substrate comprises bulk monocrystalline silicon (see paragraphs 4-7). Graettinger teaches that in the processing of integrated circuits the wafer substrate typically comprises monocrystalline silicon (col.1/ll.20-24). It would have been obvious at the time of the invention to one of ordinary skill in the art to have monocrystalline silicon in the capacitor of Anderson, in view of Shimizu, as suggested by Graettinger, because in the processing of integrated circuits the wafer substrate is typically monocrystalline silicon.

Response to Arguments

13. Applicant's arguments with respect to claim1 and 4-16 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

14. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Flanagan (US 3,210,607) teaches the use of different chemical compositions of dielectric layers to improve the temperature-sensing electrical control of a capacitor.

15. Papers related to this application may be submitted directly to Art Unit 2814 by facsimile transmission. Papers should be faxed to Art Unit 2814 via the Art Unit 2814 Fax Center located in Crystal Plaza 4, room 4C23. The faxing of such papers must

conform to the notice published in the Official Gazette, 1096 OG 30 (15 November 1989). The Art Unit 2814 Fax Center number is **(703) 308-7722** or **-7724**. The Art Unit 2814 Fax Center is to be used only for papers related to Art Unit 2814 applications.

16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Marcos D. Pizarro-Crespo** at **(703) 308-6558** and between the hours of 8:00 AM to 4:00 PM (Eastern Standard Time) Monday through Friday or by e-mail via Marcos.Pizarro@uspto.gov. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri, can be reached on (703) 306-2794.

Any inquiry of a general nature or relating to the status of this application should be directed to the **Group 2800 Receptionist** at **(703) 308-0956**.

17. The following list is the Examiner's field of search for the present Office Action:

Field of Search	Date
U.S. Class / Subclass(es): 257/310, 438/240, 361/313	8/20/2001
Other Documentation:	
Electronic Database(s): EAST (USPAT, EPO, JPO)	8/20/2001

Marcos D. Pizarro-Crespo
Patent Examiner
Group Art Unit 2814
703-308-6558
marcos.pizarro@uspto.gov

MDP/mdp
10/16/2000

OLIK CHAUDHURI
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800